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Jameco Part Number 181809

LCD MODULE DATA SHEET

MODEL NUMBER: SKD204-671

FEATURE SET:

- CHARACTER DISPLAY
- ENGLISH & JAPANESE CHARACTERS
- 20 CHARACTERS BY 4 LINES
- WHITE EL BACKLIGHT
- SERIAL INTERFACE
- LOW POWER 3V DESIGN
- POWER SAVING SLEEP MODE
- BUILT-IN TEMPERATURE COMPENSATION CIRCUITRY
- COMPACT DESIGN

SPECIFICATIONS NUMBER:	ORIGINAL DATE OF ISSUE:	DATE OF REVISION:	REVISION:
8P671R01.123	23 AUG 1999	23 AUG 2000	0.1

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REVISION HISTORY

REV LEVEL	REV DATE	PAGES	CHANGE DESCRIPTION	APPROVAL
0	23/08/99	ALL	INITIAL ISSUE.	
0.1	23/08/00	ALL	CONTACT DATA UPDATED, CG-ROM TABLE ADDED, PAGES INCREASED FROM 12 to 14.	JDW

1) **MANUFACTURER'S NUMBER** : SKD204-671SSH-EW

2) **MECHANICAL CHARACTERISTICS**

Module Dimensions	:	90.0 (W) X 50.0 (H) X 10.5 max (T)
Display Format	:	20 Characters X 4 Lines
Display Font	:	5 X 8 Dot Matrix
Display Technology	:	Super Twisted Nematic
Display Color Mode	:	Gray
Display Transmission Mode	:	Positive
Active (Image) Area	:	20.8 (H) X 70.4 (W) mm
Viewing Area	:	25.4 (H) X 76.0 (W) mm
Dot Size	:	0.55 (H) X 0.55 (W) mm
Dot Pitch	:	0.60 (H) X 0.60 (W) mm
Viewing Angle	:	6 o'clock (ø = 0)
LCD Drivers	:	Samsung KS0073-02, KS0065B
Driving Scheme	:	1/32 duty, 1/6.7 bias
Backlight Type	:	Electroluminiscent Lamp
Backlight Color	:	White
Dimensional Diagram	:	9M671P01 (page 7)
Weight	:	approx. 44g

(W: Width, H: Height, T: Thickness)

3) **ABSOLUTE MAXIMUM RATINGS**

3.1 **Electrical Maximum Ratings (Ta = 25 deg C)**

ITEM	SYMBOL	CONDITION	MIN	MAX	UNIT
Supply Voltage (Logic)	Vcc-Vss	-	0	4.5	V
Input Voltage	Vi	-	-0.3	Vcc + 0.3	V

3.2 **Environmental Conditions**

ITEM	SYMBOL	CONDITION	MIN	MAX	UNIT
Operating Temp	Topr	-	-20	70	°C
Storage Temp	Ttsg	-	-30	80	°C
Humidity Endurance	RH	no condensation Ta ≤ 40 deg C		95	%
Vibration	-	3 directions	see note (a), page 3		
Shock	-	3 directions	see note (b), page 3		

3.2 **Environmental Conditions** (continued from page 2)

note (a) : Frequency : varying from 10 Hz to 55 Hz in a 1-minute cycle
Amplitude : 1.5 mm
Duration : 120 cycles, each lasting 1 minute,
for each of the 3 directions, x,y,z

note (b) : Mutually perpendicular directions:
- Direction normal to surface of LCD glass
  80G, half-sine pulse of duration 11ms
- Other 2 directions
  100G, half-sine pulse of duration 11ms

4) ELECTRICAL SPECIFICATIONS

4.1 Interface Definition

Pin No.	Symbol	Description
1	Vss	Ground
2	Vcc	Voltage Supply for logic (+3V*)
3	DO	Serial Data Out
4	CK	Serial Clock
5	DI	Serial Data In
6	$\overline{CS}$	Chip Select (Low selects)
7	$\overline{BOFF}$	Backlight Off (Low deactivates)
8	VEL	Voltage Supply for built-in EL inverter (+3V*)

* A single +3V supply may be used for both VEL and Vcc.

4.2 Electrical Characteristics at Ta = 25°C, Vcc = 3V±5%

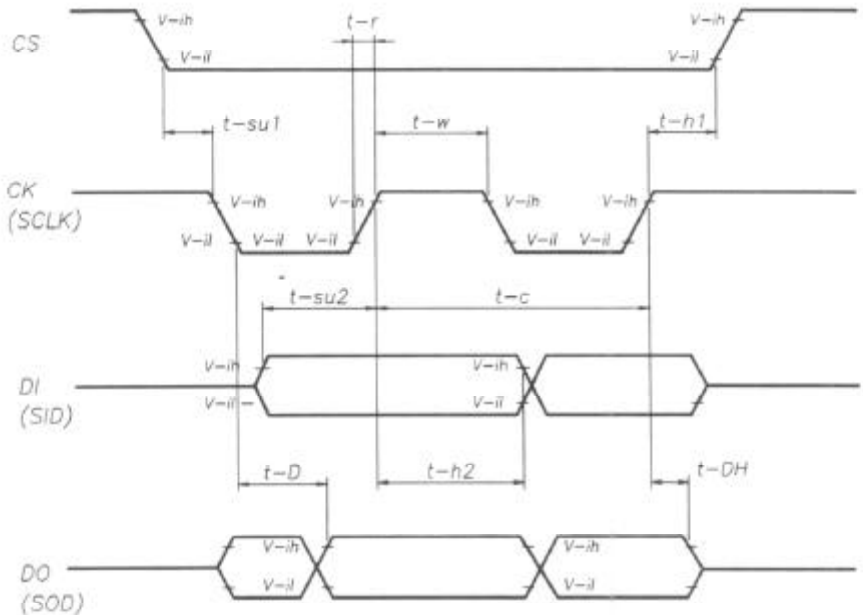
ITEM	SYMBOL	CONDITION	MIN	TYP	MAX	UNIT
Supply Voltage (logic)	Vcc-Vss	-	2.90	3.0	3.10	V
Supply Voltage (LCD)	Vcc-Vee	built-in converter				V
Input signal voltage	V-ih	"H" level	0.7Vcc	-	Vcc	V
	V-il	"L" level	-0.3	-	0.2Vcc	V
Supply Current (logic)	Icc	-	-	4.5	5.0	mA
Supply Current (sleep)	I-pwd	-	-	2.4	2.6	mA
Supply Voltage (EL)	V-el	-	2.9	3.0	3.1	V
Supply Current (EL)	I-el	-	-	26.0	-	mA

4.3 Timing Specifications at Ta = 25°C, Vcc = 3V±5%, Vss = 0V

ITEM	SYMBOL	MIN	TYP	MAX	UNIT
Serial Clock Cycle time	*t-c*	1	-	20	μs
Serial Clock Rise / Fall time	*t-r, t-f*	-	-	50	ns
Serial Clock width (High, Low)	*t-w*	400	-	-	ns
Chip Select Setup time	*t-su1*	60	-	-	ns
Chip Select Hold time	*t-h1*	20	-	-	ns
Serial Input Data Setup time	*t-su2*	200	-	-	ns
Serial Input Data Hold time	*t-h2*	200	-	-	ns
Serial Output Data Setup time	*t-D*	-	-	360	ns
Serial Output Data Hold time	*t-DH*	5	-	-	ns

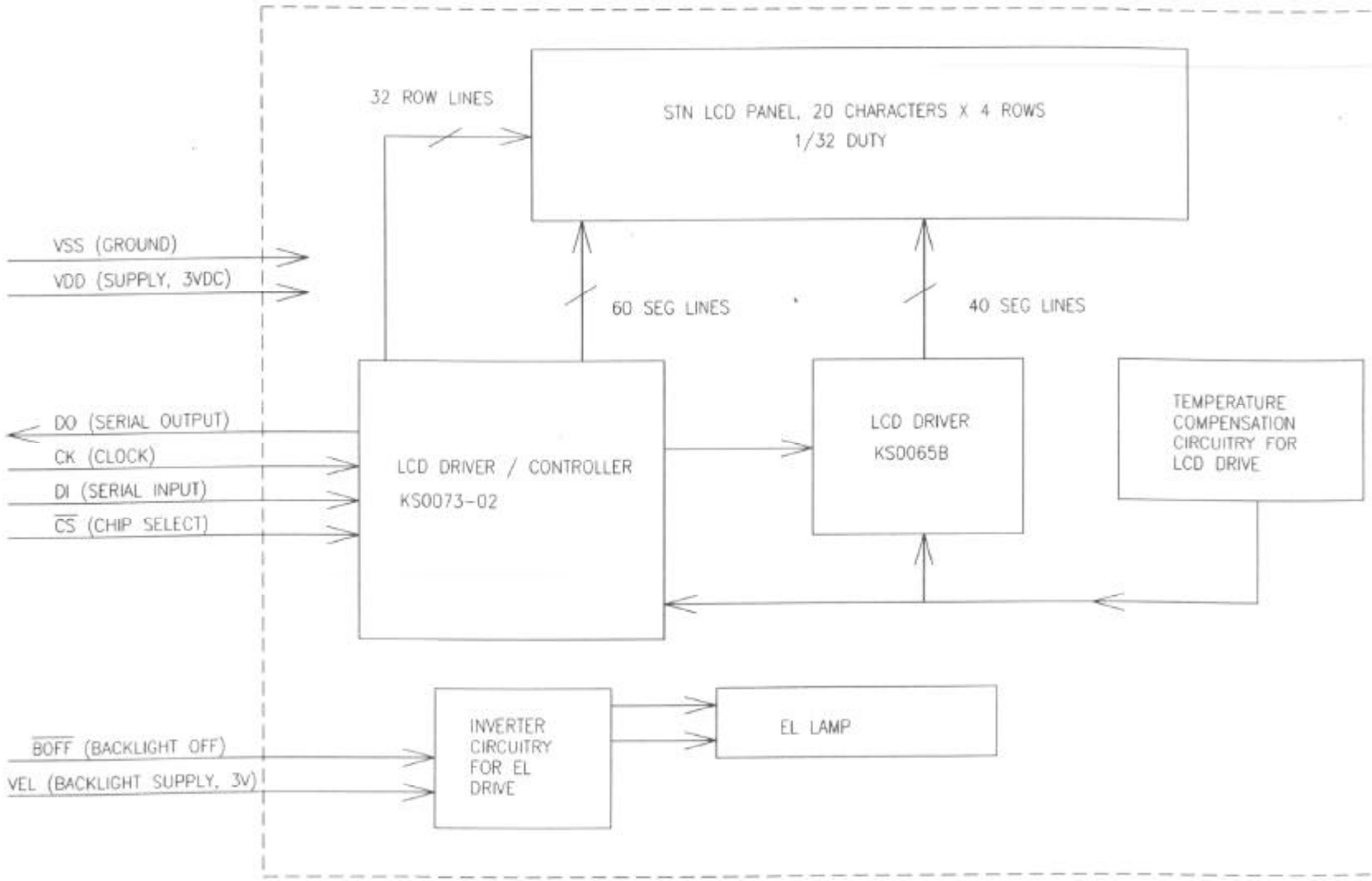
4.4 Timing Diagram for KS0073

SERIAL MODE TIMING DIAGRAM FOR KS0073



REVISIONS ARE INDICATED BY CIRCLED LETTERS

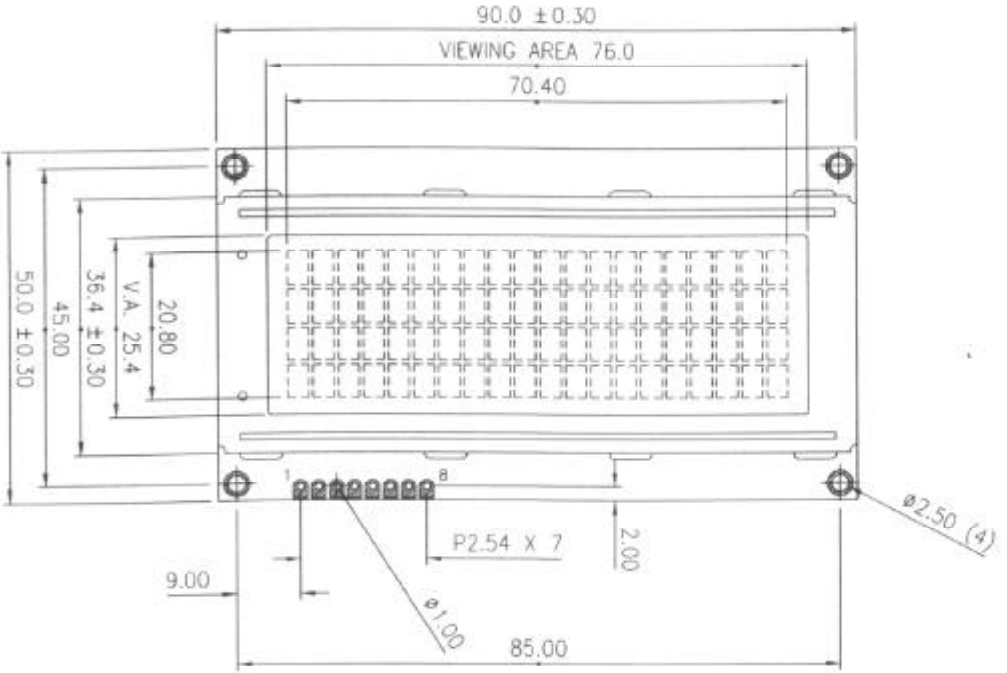
ALL DIMENSIONS ARE IN MILLIMETRES

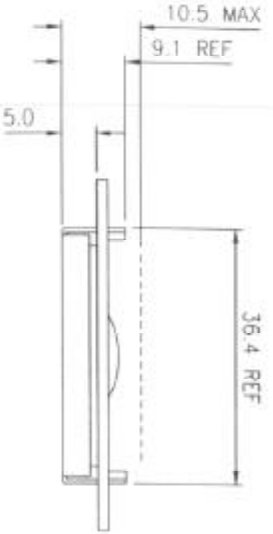


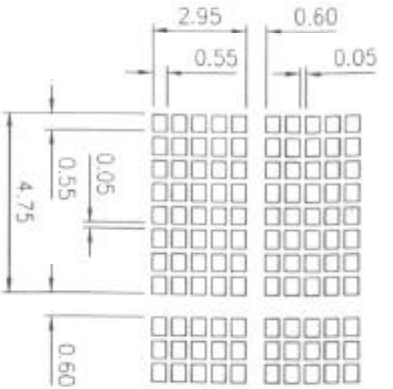
KATO-DENKI	TITLE: BLOCK DIAGRAM		SCALE: N.A.	GEN. TOL.: X.X = ±0.20, X.XX = ±0.10, ANG = ±0.5'			

REVISIONS ARE INDICATED BY CIRCLED LETTERS

ALL DIMENSIONS ARE IN MILLIMETRES







MATRIX DETAILS (N-T-S)

THIS DRAWING IS APPLICABLE TO THE FOLLOWING SUB-VARIANTS :-

SKD204-671SSH-EW

PIN NBR	1	2	3	4	5	6	7	8
FUNCTION	Vss	Vdd	DO	CK	DI	$\overline{CS}$	$\overline{BOFF}$	VEL

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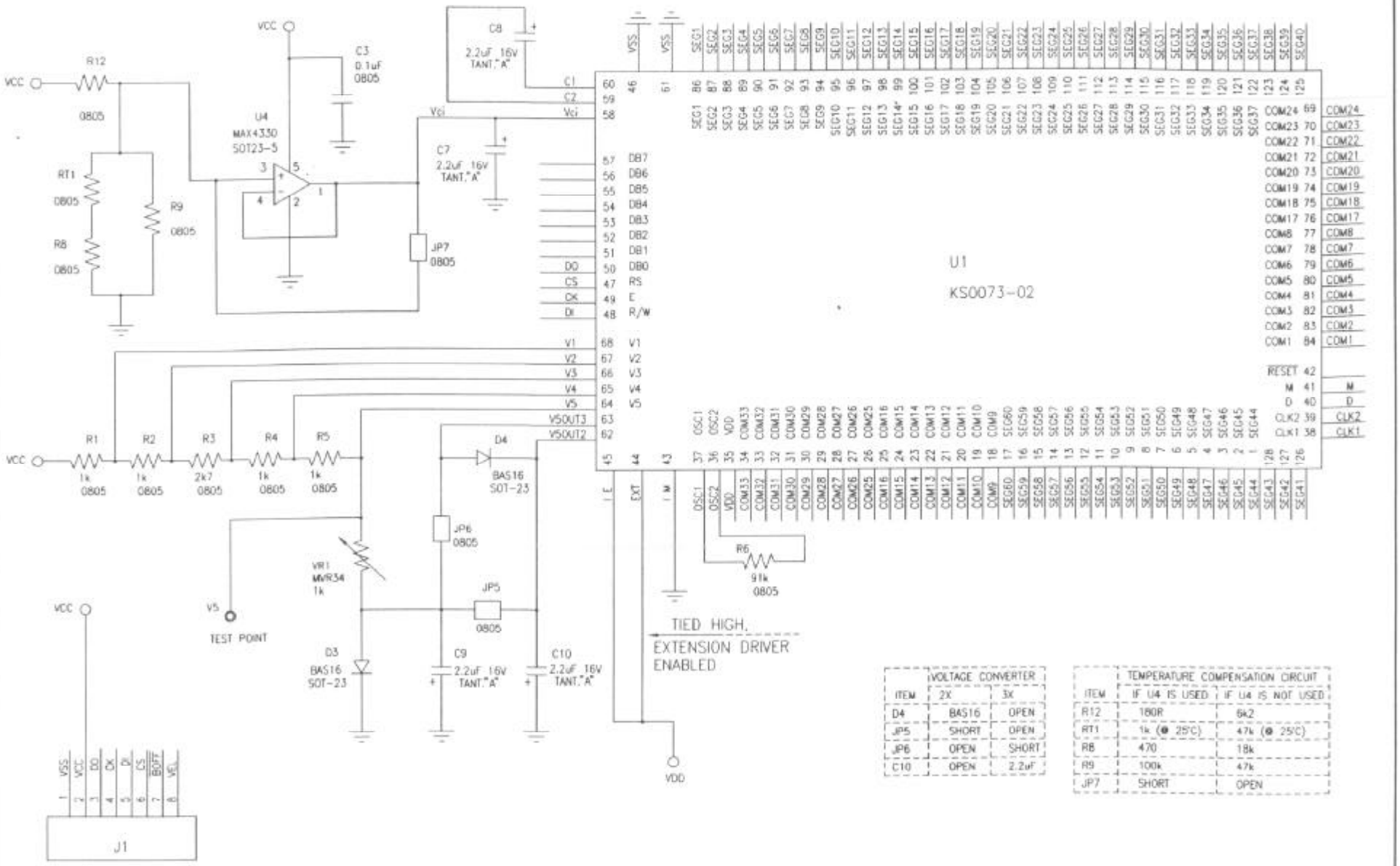
TITLE: MECHANICAL PRODUCT SPECIFICATIONS

SCALE 1 = 1

GEN. TOL.
X.X = ±0.20
X.XX = ±0.10
ANG = ±0.5°

REVISIONS ARE INDICATED BY CIRCLED LETTERS

ALL DIMENSIONS ARE IN MILLIMETRES



ITEM	VOLTAGE CONVERTER 2X	3X
D4	BAS16	OPEN
JP5	SHORT	OPEN
JP6	OPEN	SHORT
C10	OPEN	2.2uF

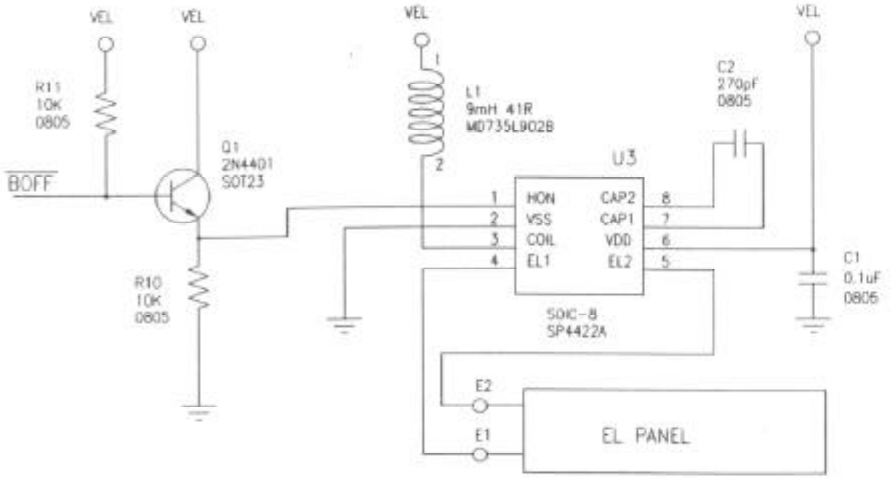
ITEM	TEMPERATURE COMPENSATION CIRCUIT IF U4 IS USED	IF U4 IS NOT USED
R12	180R	6k2
RT1	1k (@ 25°C)	47k (@ 25°C)
R8	470	18k
R9	100k	47k
JP7	SHORT	OPEN

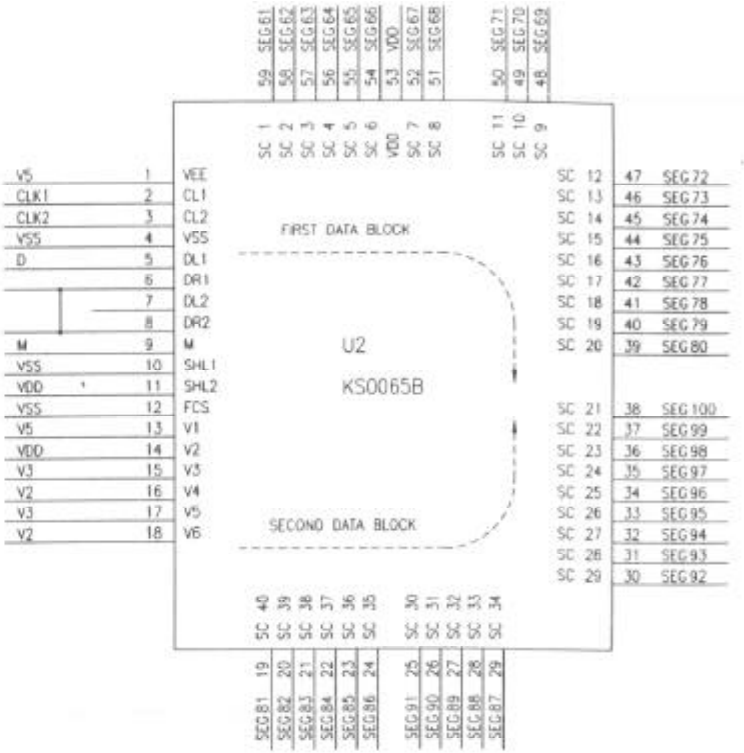
KATO-DENKI	TITLE: SCHEMATICS		SCALE: N.A.	GEN. TOL. X.X = ±0.20 X.XX = ±0.10 ANG = ±0.5°	

REVISIONS ARE INDICATED BY CIRCLED LETTERS

ALL DIMENSIONS ARE IN MILLIMETRES

INVERTER CIRCUITRY





KATO-DENKI	TITLE: SCHEMATICS		SCALE: N.A.	GEN. TOL.: X.X = ±0.20, X.XX = ±0.10, ANG = ±0.5°		

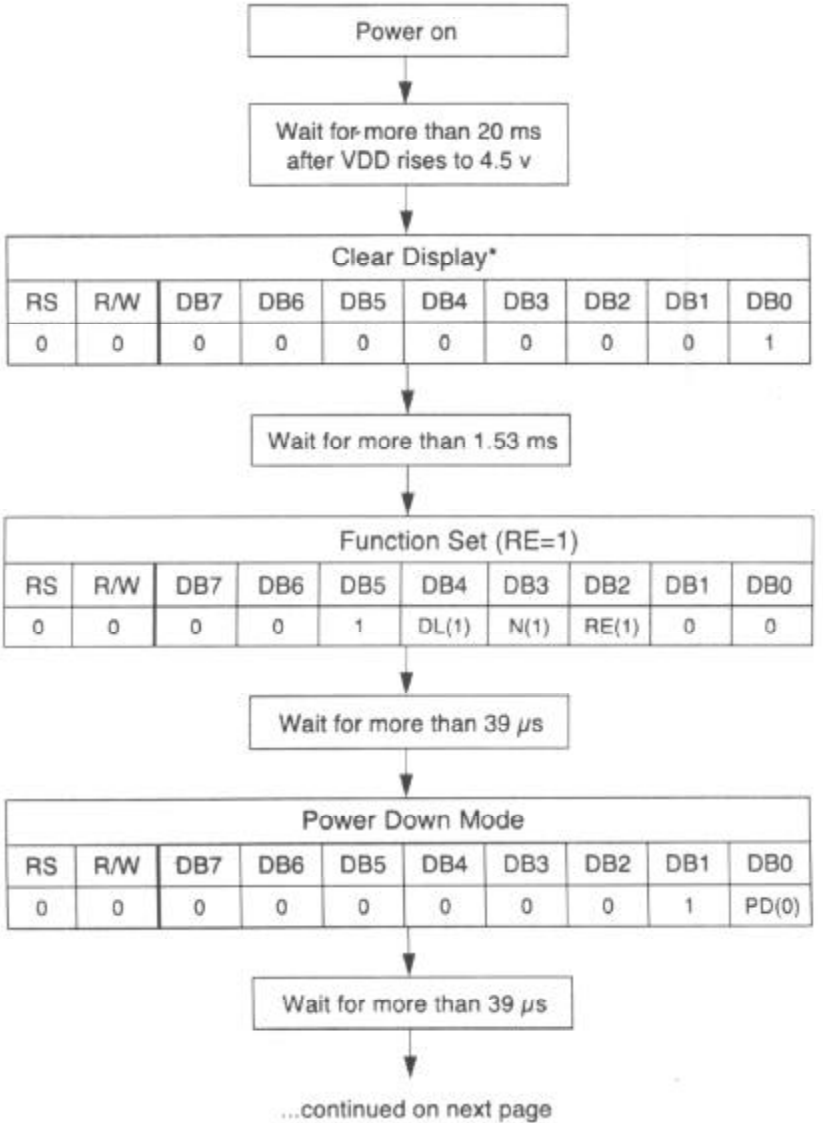
APPENDIX A: Programming the LCD Module

1. Please refer to the Samsung Databook for LCD Drivers, device KS0073, for programming details. A PDF datasheet of the KS0073 is available online at:
`http://intl.samsungsemi.com/System_LSI/LCD_Driver_IC/Character/KS0073/DS-KS0073-V0.PDF`

2. Recommended initialization routine for the SKD204-671:

INITIALIZING BY INSTRUCTION

1) 8-bit interface mode



DL	1	8-bit interface
N	1	2-line mode
PD	0	Power down disable

...continued on next page

* A "Write" START BYTE (11111010) must be sent prior to this instruction. Refer to the "Interface with MPU in Serial Mode" section of the Samsung KS0073 Datasheet for details.

APPENDIX A: Programming the LCD Module

...continued from previous page

Extended Function Set									
RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	1	FW(0)	B/W(0)	NW(1)

FW	0	5-dot font width
B/W	0	Cursor invert disable
NW	1	4-line display mode

Wait for more than 39 μs

Function Set (RE=0)									
RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	1	DL(1)	N(1)	RE(0)	0	0

Wait for more than 39 μs

Display ON/OFF Control									
RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	1	D(1)	C(0)	B(0)

D	0	Display = ON
C	0	Cursor = OFF
B	1	Blink = OFF

Wait for more than 39 μs

Clear Display*									
RS	R/W	DB7	DB6	DB5	DB4	DB3	DB2	DB1	DB0
0	0	0	0	0	0	0	0	0	1

Wait for more than 1.53 ms

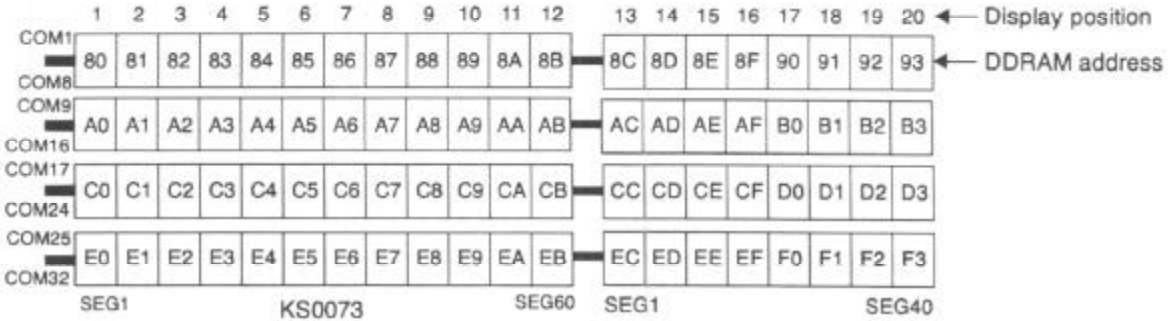
Initialization end

* A "Write" START BYTE (11111010) must be sent prior to this instruction. Refer to the "Interface with MPU in Serial Mode" section of the Samsung KS0073 Datasheet for details.

3. KS0073 Notes:
   a. IE is permanently tied HI. Be sure to use the appropriate instruction set. (Refer to the instruction set given in "Table 6" of the Samsung KS0073 Datasheet.)
   b. Extended Function Set (RE=1) bit, FW, should always be LO.

APPENDIX A: Programming the LCD Module

4. Display Data Ram (DDRAM) Address Table:



APPENDIX A: Programming the LCD Module

5. Character Generator ROM